Lecture Notes in Computer Science  7893

Commenced Publication in 1973
Founding and Former Series Editors:
Gerhard Goos, Juris Hartmanis, and Jan van Leeuwen

Editorial Board

David Hutchison
    Lancaster University, UK
Takeo Kanade
    Carnegie Mellon University, Pittsburgh, PA, USA
Josef Kittler
    University of Surrey, Guildford, UK
Jon M. Kleinberg
    Cornell University, Ithaca, NY, USA
Alfred Kobsa
    University of California, Irvine, CA, USA
Friedemann Mattern
    ETH Zurich, Switzerland
John C. Mitchell
    Stanford University, CA, USA
Moni Naor
    Weizmann Institute of Science, Rehovot, Israel
Oscar Nierstrasz
    University of Bern, Switzerland
C. Pandu Rangan
    Indian Institute of Technology, Madras, India
Bernhard Steffen
    TU Dortmund University, Germany
Madhu Sudan
    Microsoft Research, Cambridge, MA, USA
Demetri Terzopoulos
    University of California, Los Angeles, CA, USA
Doug Tygar
    University of California, Berkeley, CA, USA
Gerhard Weikum
    Max Planck Institute for Informatics, Saarbruecken, Germany
Scale Space 
and Variational Methods 
in Computer Vision

4th International Conference, SSVM 2013 
Schloss Seggau, Leibnitz, Austria, June 2-6, 2013 
Proceedings
Preface

The 4th International Conference on Scale Space and Variational Methods in Computer Vision (SSVM 2013) was held in Schloss Seggau, Leibnitz, in the vicinity of Graz, Austria. The biannual SSVM Conferences started in 2007 in Ischia, Italy (2007), and were followed by editions in Voss, Norway (2009), and Ein Gedi, Israel (2011).

This series of conferences originated from the biannual conferences on Scale Space held in 1997 in Utrecht, The Netherlands, and Variational, Geometric, and Level set Methods (VLSM) in 2001 in Vancouver, Canada. The aim of SSVM is to bring together these two different communities with common research interests: the one on scale space analysis and the one on variational, geometric, and level set methods and their applications in image interpretation and understanding. Just as in previous editions, the papers in these proceedings depict this successful combination.

Following the tradition of the previous SSVM conferences, we invited outstanding scientists to give keynote presentations and were happy to welcome:

- Gabriel Peyré (CNRS, CEREMADE, Université Paris-Dauphine): Inverse Problem Regularization with Weakly Decomposable Priors
- Martin Rumpf (University of Bonn): Variational Time Discretization of Geodesic Calculus in Shape Space
- Tony Lindeberg (KTH Royal Institute of Technology): A Framework for Invariant Visual Operations Based on Receptive Field Responses

From the 69 submitted papers, 19 were selected to be presented orally and 23 as posters. We would like to thank the authors for their contributions and the members of the Program Committee for their dedication and timely reviews.

We would like to sincerely thank Christine Haas from the sterreichische Computer Gesellschaft (OCG), Christiane Tronigger from Nethotels, and Sabine Tschernegg from Schloss Seggau for their help with the local arrangements.

March 2013

Arjan Kuijper
Kristian Bredies
Thomas Pock
Horst Bischof
Organization

Conference Chairs

Arjan Kuijper
Fraunhofer IGD, Germany
Kristian Bredies
University of Graz, Austria
Thomas Pock
Graz University of Technology, Austria
Horst Bischof
Graz University of Technology, Austria

Program Committee

Members

Luis Alvares
Universidad de Las Palmas de Gran Canaria, Spain
Jean-François Aujol
University of Bordeaux, France
Michael Breuß
BTU Cottbus, Germany
Thomas Brox
University of Freiburg, Germany
Freddy Bruckstein
Technion, Israel
Andres Brun
University of Stuttgart, Germany
Antonin Chambolle
Ecole Polytechnique, CMAP, France
Raymond Chan
Chinese University of Hong Kong, SAR China
Laurent Cohen
Ceremade, France
Remco Duits
Eindhoven University, The Netherlands
Jalal Fadili
ENSICAEN, France
Michael Felsberg
Linkopings Universitet, Sweden
Luc Florack
Eindhoven University of Technology, The Netherlands
Lewis Griffin
University College London, UK
Atsushi Imiya
Chiba University, Japan
Sung-Ha Kang
Georgia Tech, USA
Ron Kimmel
Technion, Israel
Nahum Kiryati
Tel Aviv University, Israel
Stefan Kunis
University of Osnabruck, Germany
François Lauze
University of Copenhagen, Denmark
Antonio Leitao
Federal University of Santa Catarina, Brazil
Dirk Lorenz
University of Braunschweig, Germany
Étienne Mémin
IRSIA, France
Jan Modersitzki
University of Lübeck, Germany
Mila Nikolova
Ecole Normale Superieur Cachan, France
Stanley Osher
UCLA, USA
Nikos Paragios
Ecole Centrale de Paris, France
VIII Organization

Guy Rosman  
Martin Rumpf  
Chen Sagiv  
Otmar Scherzer  
Christoph Schnörr  
Carola Schönlieb  
Fiorella Sgallari  
Jon Sporring  
Kim Steenstrup Pedersen  
Gabriele Steidl  
Xue-Cheng Tai  
Bart ter Haar Romeny  
Joachim Weickert  
Gershon Wolansky

Technion, Israel  
University of Bonn, Germany  
SagivTech Ltd., Israel  
University of Vienna, Austria  
University of Heidelberg, Germany  
University of Cambridge, UK  
University of Bologna, Italy  
University of Copenhagen, Denmark  
University of Copenhagen, Denmark  
University of Kaiserslautern, Germany  
University of Bergen, Norway  
Eindhoven University of Technology, The Netherlands  
Saarland University, Germany  
Technion, Israel
Table of Contents

Image Denoising and Restoration

Targeted Iterative Filtering .................................................. 1
  *Freddie Åström, Michael Felsberg, George Baravidish, and Claes Lundström*

Generalized Gradient on Vector Bundle – Application to Image
  Denoising ........................................................................... 12
  *Thomas Batard and Marcelo Bertalmío*

Expert Regularizers for Task Specific Processing ................... 24
  *Guy Gilboa*

A Spectral Approach to Total Variation .................................. 36
  *Guy Gilboa*

Convex Generalizations of Total Variation Based on the Structure
  Tensor with Applications to Inverse Problems ...................... 48
  *Stamatios Lefkimmiatis, Anastasios Roussos, Michael Unser, and Petros Maragos*

Adaptive Second-Order Total Variation: An Approach Aware of Slope
  Discontinuities ................................................................... 61
  *Frank Lenzen, Florian Becker, and Jan Lellmann*

Variational Methods for Motion Deblurring with Still Background ...
  *Eileen Laue and Dirk A. Lorenz*

Blind Deblurring Using a Simplified Sharpness Index .............. 86
  *Arthur Leclaire and Lionel Moisan*

A Cascadic Alternating Krylov Subspace Image Restoration Method ...
  *Serena Morigi, Lothar Reichel, and Fiorella Sgallari*

B-SMART: Bregman-Based First-Order Algorithms for Non-negative
  Compressed Sensing Problems ............................................ 110
  *Stefania Petra, Christoph Schnörr, Florian Becker, and Frank Lenzen*

Epigraphical Projection for Solving Least Squares Anscombe
  Transformed Constrained Optimization Problems ................... 125
  *Stanislav Harizanov, Jean-Christophe Pesquet, and Gabriele Steidl*
Image Enhancement and Texture Synthesis

Static and Dynamic Texture Mixing Using Optimal Transport .......... 137
   Sira Ferradans, Gui-Song Xia, Gabriel Peyré, and Jean-François Aujol

A TGV Regularized Wavelet Based Zooming Model .................. 149
   Kristian Bredies and Martin Holler

Anisotropic Third-Order Regularization for Sparse Digital Elevation
Models ................................................................. 161
   Jan Lellmann, Jean-Michel Morel, and Carola-Bibiane Schönlieb

A Fast Algorithm for Exact Histogram Specification. Simple Extension
to Colour Images .................................................. 174
   Mila Nikolova

Constrained Sparse Texture Synthesis .............................. 186
   Guillaume Tartavel, Yann Gousseau, and Gabriel Peyré

Outlier Removal Power of the L1-Norm Super-Resolution ............ 198
   Yann Traonmilin, Saïd Ladjal, and Andrés Almansa

Optical Flow and 3D Reconstruction

Why Is the Census Transform Good for Robust Optic Flow
Computation? .......................................................... 210
   David Hafner, Oliver Demetz, and Joachim Weickert

Generalised Perspective Shape from Shading in Spherical
 Coordinates .................................................................. 222
   Silvano Galliani, Yong Chul Ju, Michael Breuß, and Andrés Bruhn

Weighted Patch-Based Reconstruction: Linking (Multi-view) Stereo
to Scale Space ......................................................... 234
   Ronny Klowsky, Arjan Kuijper, and Michael Goesele

Optical Flow on Evolving Surfaces with an Application to the Analysis
of 4D Microscopy Data .................................................. 246
   Clemens Kirisits, Lukas F. Lang, and Otmar Scherzer

Perspective Photometric Stereo with Shadows ......................... 258
   Roberto Mecca, Guy Rosman, Ron Kimmel, and Alfred M. Bruckstein

Solving the Uncalibrated Photometric Stereo Problem Using Total
Variation ................................................................. 270
   Yvain Quéau, François Lauze, and Jean-Denis Durou
Minimizing TGV-Based Variational Models with Non-convex Data
Rene Ranftl, Thomas Pock, and Horst Bischof
282

A Mathematically Justified Algorithm for Shape from Texture
Helge Rhodin and Michael Breuß
294

Scale Space and Partial Differential Equations

Multi Scale Shape Index for 3D Object Recognition
Ujwal Bonde, Vijay Badrinarayanan, and Roberto Cipolla
306

Compression of Depth Maps with Segment-Based Homogeneous Diffusion
Sebastian Hoffmann, Markus Mainberger, Joachim Weickert, and Michael Puhl
319

Scale Space Operators on Hierarchies of Segmentations
B. Ravi Kiran and Jean Serra
331

Discrete Deep Structure
Martin Tschirsich and Arjan Kuijper
343

Image Matching Using Generalized Scale-Space Interest Points
Tony Lindeberg
355

A Fully Discrete Theory for Linear Osmosis Filtering
Oliver Vogel, Kai Hagenburg, Joachim Weickert, and Simon Setzer
368

$L^2$-Stable Nonstandard Finite Differences for Anisotropic Diffusion
Joachim Weickert, Martin Welk, and Marco Wickert
380

Relations between Amoeba Median Algorithms and Curvature-Based PDEs
Martin Welk
392

Image and Shape Analysis, Segmentation

Scale and Edge Detection with Topological Derivatives
Guozhi Dong, Markus Grasmair, Sung Ha Kang, and Otmar Scherzer
404

Active Contours for Multi-region Image Segmentation with a Single Level Set Function
Anastasia Dubrovina, Guy Rosman, and Ron Kimmel
416

Regularized Discrete Optimal Transport
Sira Ferradans, Nicolas Papadakis, Julien Rabin, Gabriel Peyré, and Jean-François Aujol
428
<table>
<thead>
<tr>
<th>Title</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>Variational Method for Computing Average Images of Biological Organs</td>
<td>440</td>
</tr>
<tr>
<td><em>Shun Inagaki, Atsushi Imiya, Hidekata Hontani, Shouhei Hanaoka, and Yoshitaka Masutani</em></td>
<td></td>
</tr>
<tr>
<td>A Hierarchical Approach to Optimal Transport</td>
<td>452</td>
</tr>
<tr>
<td><em>Bernhard Schmitzer and Christoph Schnörr</em></td>
<td></td>
</tr>
<tr>
<td>Layered Mean Shift Methods</td>
<td>465</td>
</tr>
<tr>
<td><em>Milan Šurkala, Karel Mozdřen, Radovan Fusek, and Eduard Sojka</em></td>
<td></td>
</tr>
<tr>
<td>Partial Optimality via Iterative Pruning for the Potts Model</td>
<td>477</td>
</tr>
<tr>
<td><em>Paul Swoboda, Bogdan Savchynskyy, Jörg Kappes, and Christoph Schnörr</em></td>
<td></td>
</tr>
<tr>
<td>Wimmelbild Analysis with Approximate Curvature Coding Distance Images</td>
<td>489</td>
</tr>
<tr>
<td><em>Julia Bergbauer and Sibel Tari</em></td>
<td></td>
</tr>
<tr>
<td>Defect Classification on Specular Surfaces Using Wavelets</td>
<td>501</td>
</tr>
<tr>
<td><em>Andreas Hahn, Mathias Ziebarth, Michael Heizmann, and Andreas Rieder</em></td>
<td></td>
</tr>
<tr>
<td>Author Index</td>
<td>513</td>
</tr>
</tbody>
</table>